State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-144
Relating to Exemptions under Section 27156
of the Vehicle Code

PORSCHE MAILORDER'S
WEBER 40 IDA 3C CARBURETOR AND CONVERSION KIT

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the Weber 40 IDA 3C carburetor and conversion kit distributed by Porsche Mailorder, Santa Monica, California 90402, has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for limited 1969-1973 Porsche 911's for the engines and models listed below:

Engine Size (L) and Model	Venturi (mm)	Main Jet (mm)	Emulsion Tube	Idle Jet (mm)	Air Cor. Jet (mm)
2.0E, 2.2E	30	1.25	F-26	0.55	1.80
2.0S	30	1.25	F-3	0.55	1.80
2.2S	32	1.30	F-32	0.55	1.80
2.4T	30	1.30	F-2	0.55	1.80
2.4E	32	1.35	F-2	0.60	1.80
2.4S	32	1.35	F-3	0.60	1.80

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale, or advertise any component of a kit as an individual device.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE WEBER 40 IDA 3C CARBURETOR AND CONVERSION KIT.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

> "43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 6th day of December, 1983.

K. D. Drachand, Chief
Mobile Source Division

STATE OF CALIFORNIA

AIR RESOURCES BOARD

EVALUATION OF PORSCHE MAILORDER'S 40 IDA 3C WEBER CARBURETOR AND CONVERSION KIT FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 OF THE CALIFORNIA ADMINISTRATIVE CODE

NOVEMBER, 1983

EVALUATION OF PORSCHE MAILORDER'S 40 IDA 3C WEBER CARBURETOR AND CONVERSION KIT FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 OF THE CALIFORNIA ADMINISTRATIVE CODE

by

MOBILE SOURCE DIVISION

State of California
AIR RESOURCES BOARD
9528 Telstar Avenue
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SUMMARY

Porsche Mailorder has requested exemption from the prohibitions in Vehicle Code Section 27156 for an aftermarket carburetor and conversion kit. The total kit is designed to replace the original equipment mechanical fuel injection found on limited 1969-1973 Porsche 911 E, S, and T model-year vehicles.

The applicant in order to demonstrate no adverse emissions effect with the use of the conversion kit performed comparative exhaust emission tests. The test results revealed that:

i) stock systems are high emitters due to age and deterioration and that repair parts are quite costly acting as a deterrence for owners to repair; and

ii) the conversion kit being applied for did not increase the emissions of the vehicle tested.

Based on the engineering evaluation of the conversion kit and an analysis of emission test data, the staff recommends that the application be granted exemption for the vehicles applied for and that Executive Order D-144 be issued.

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I. INTRODUCTION

Porsche Mailorder located in Santa Monica, California 90402, has applied for exemption from the prohibitions of Vehicle Code Section 27156 for an aftermarket add-on replacement carburetor and conversion kit. The applicant specifically requested that the conversion kit, which includes two model 40 IDA 3C Weber carburetors, two intake manifolds, carburetor linkage and two air cleaner adapters, be used in place of the original equipment (OE) mechanical fuel injection found on limited 1969 through 1973 Porsche 911 E, S, and T model-year vehicles.

The applicant, in order to demonstrate that an adverse emissions impact would not occur with the use of the conversion kit, performed comparative exhaust emission tests on a vehicle equipped with the OE mechanical injection and then with the aftermarket carburetor kit.

This report describes the Air Resources Board's (ARB) evaluation of the Weber model 40 IDA 3C carburetors and conversion kit and discusses the findings of the evaluation.

II. CONCLUSIONS

Based upon the applicant's submitted comparative exhaust emission data and an analysis of in-use vehicle emission test data, the staff has concluded that the installation of the Weber 40 IDA 3C carburetors would not cause an adverse emissions impact.

III. RECOMMENDATIONS

The staff, therefore, recommends that Porsche Mailorder be granted exemption from the prohibitions in Vehicle Code Section 27156 for the vehicles as requested.

The staff also recommends that Executive Order D-144 be issued allowing use of the Weber 40 IDA 3C carburetors and conversion kit on limited 1969-1973 Porsche 911 E, S, and T model-year vehicles.

IV. DEVICE DESCRIPTION

The Weber 40 IDA 3C carburetor is of a triple venturi downdraft type and two units are required for each application (Diagram 1). All throttles (6) are simultaneously operated by a common linkage.

Each paired triple venturi carburetor contains a dual float and individual idle, main, and accelerator circuits. However, it contains neither a choke nor a power enrichment circuit which is common among these types of carburetors.

Weber carburetors are well known as being adaptable for various types of driving applications. In order for the applicant to provide standardized components for individual vehicle applications by engine and model designation, Table 1 is provided.

Table 1
Weber 40 IDA 3C Component Variables

Engine Size and Model	Venturi (mm)	Main Jet (mm)	Emulsion Tube	Idle Jet (mm)	Air. Cor. Jet (mm)
2.0E, 2.2E(1)	30	1.25	F-26	0.55	1.80
2.0S(1)	30	1.25	F-3	0.55	1.80
2.2S(1)	32	1.30	F-32	0.55	1.80
2.4T*(2)	30	1.30	F-2	0.55	1.80
2.4E(2)	32	1.35	F-2	0.60	1.80
2.4S(2)	32	1.35	F-3	0.60	1.80

*Model used for exhaust emission evaluation.
(1) Uses OE air cleaner w/o adapters.
(2) Uses OE air cleaner w/adapters.

All of Porsche Mailorder's Weber 40 IDA 3C carburetors use special extended secondary venturi tubes.

The applicant also provides two different intake manifolds depending upon the engine's intake port diameter. Porsche Models T and E receive a 40x32 mm manifold while the model S receives a 40x36 mm manifold. Since the installation of the Weber carburetors necessitates removal of the OE fuel injection components, special plugs (6) are provided in each kit to plug the hole for the individual fuel injection nozzles where they normally screw into the cylinder head. The OE fuel pump is retained but a special fuel block with a pressure regulator is added to allow individual fuel supplies to each carburetor.

The applicant's mixture adjustment procedures for the Weber 40 IDA 3C carburetors are found in Appendix 1. The procedure basically states that the carburetors are to be adjusted equally and individually to obtain the smoothest idle. A "Uni-Syn" (air flow meter) is needed to measure and adjust each venturi for equal air flow.

Idle HC/CO limits are not given for adjustment of the carburetors, however, when adjustments are performed according to the installation instructions, the emission levels are less than the MVIP idle standard adopted by the State for this type of vehicle.

V. DEVICE EVALUATION

The applicant submitted comparative exhaust emission tests performed by the Automobile Club of Southern California. The procedure used for the evaluation was the CVS-75 as explained in the Code of Federal Regulations, Part 86:00. The test vehicle is described in Table 2 and its comparative

exhaust emission results are found in Table 3. Paired baseline (with OE fuel injection) and paired device (with Weber 40 IDA 3C carburetors) tests were performed but only the average values of each are reported.

Prior to the baseline tests the test vehicle was adjusted and set to original equipment specifications. Although the test vehicle was 14 years old, it was purported to be well maintained and no modifications other than normal maintenance items were performed.

Table 1
Test Vehicle Description

Year	1972
Make	Porsche
Model	911 T
Eng. Size	146.4 CID (2.4L)
Emission Controls	PCV, Evap, VR(1)
Odometer Mileage	81,098
Transmission	Manual

(1) PCV - positive crankcase ventilation; Evap - Evaporative emission controls; VR - vacuum retard ignition.

Table 2
Exhaust Emission Results*

Test Type	Exhaust Emissions in gm/mi HC	CO	NOx	Fuel Economy mi/gal
Baseline	30.0	233.7	1.06	10.6
Device	16.2	154.2	1.20	11.7
1972 Stand.	3.2	39.0	3.0	-

*Results have been recalculated to the CVS-72 procedure.

The ARB did not perform confirmatory testing of the conversion kit due to lack of a well maintained test vehicle and extreme costs in repairing one to appropriate levels.

VI. DISCUSSION

As evident from the comparative emission results the baseline HC and CO values are many times the 1972 emissions standard. Although the test vehicle was repaired prior to testing, it is apparent that major fuel distribution problems still existed and were not corrected at the time of testing. There is no correlation between the MVIP idle HC/CO standards and the CVS results since during both test configurations, baseline and device, the idle emissions were less than the MVIP standards.

The staff also performed an analysis of emission inspection data of six cylinder Porsche vehicles having been tested at the time of registration change and found that 90% of the vehicles failed at least one of the idle or loaded mode HC/CO limits. The staff contacted several Porsche dealerships in the area and questioned service personnel about repairs to this type of injection system. It was found that there are limited people who can properly service these units and that repair costs could run from several hundred dollars to several thousand dollars. The availability of new OE parts is another area of concern since they are no longer available and one must rely solely on rebuilt parts. The combination of high repair costs and parts availability acts as a deterrence for proper repair of the OE system.

The Weber 40 IDA 3C carburetor kit is similar to the same carburetors used on earlier model-year Porsches. Although these carburetors require precise adjustment to operate properly, most of the early foreign vehicles use multiple carburetors similar to these and most repair personnel are familiar with them. Additionally, parts to repair or renew these carburetors are readily available.

The deterioration factor of high performance sports cars such as Porches with mileage in excess of 50,000 miles is extremely high. This is also compounded since the model-year vehicles for this application are approaching absolescence and replacement parts are becoming extinct.

Although the exhaust emission levels with the use of the Weber 40 IDA 3C carburetor kit are considerably higher than the 1972 emission standard, they are 50% less than those of the OE system.

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WEBER 40 IDA 3C ADJUSTMENT

It's being taken for granted that you have had some experience working with Porsche engines, at least at the tune-up level. Webers are easy to adjust when compared to other Porsche induction systems but they are much harder to adjust than an American two barrel. It takes a certain feel; which usually can be learned.

Before attempting to adjust the carbs the engine must have correct cam and ignition timing along with a careful valve adjustment. The points, plugs, distributor cap, ignition wires, etc., should be in like-new condition. The distributor must be mechanical advance or modified for straight mechanical advance. The compression differential between the cylinders should not exceed 20 psi max. An engine compartment fuel filter will keep the carbs clean longer. When the air cleaner is finally installed, it should have a clean element.

DEFINITIONS:

Front, Back, Left, Right, etc., are defined from your position as you sit in the driver's seat.

The Throttle Body is the main part of the carb. What it doesn't contain is attached to it.

The Mixture Screws thread into the base of each throttle bore. They have springs to maintain a setting and there are three of them in each carburetor. Be careful as you turn these in as they seat in the throttle body. Turning a mixture screw in leans the mixture and turning it out does the reverse.

The Idle Screw is sometimes called the idle stop screw. There is one on the back of each carb and it determines the minimum throttle setting through its action on the throttle arm of the carb. When this screw is turned all the way out the throttle plates rest against the throttle bores.

The Air Screws are similar to the mixture screws in that they operate on the needle valve principle. There are also three of these in each carb and they are located close to the mixture screws. They have an 8 mm lock nut on them to maintain their setting. As they are adjusted out they let air slip around the throttle plates to equalize the volume of mixture entering each cylinder at idle. The basic setting is 1/2 turn out and great care is to be taken since these screws also seat in the throttle body.

Side to Side Balance means equal vacuum between the two sides of the engine through adjusting the idle screws and throttle linkage.

TOOLS needed to adjust the carbs are:
Stubby screw drivers to adjust the mixture and air screws
STE SYNCHROMETER for adjusting vacuum at the air screws (available at Porsche Mailorder)
Two 8 mm combination wrenches plus a 7mm one.

P 226a; a Porsche special tool that allows you to check the float level with engine running (available at PORSCHE MAILORDER)
A small cc measuring vial; useful for measuring the accelerator pump injection quantity

These instructions start with the engine thoroughly cleaned and the manifolds installed with new gaskets. The linkage should be clean and high temp grease added to the ball sockets. An 8 mm open end wrench can be used as a ball joint separator. New gaskets are used under the carburetors when they are installed. The air horn shield is the part of the air cleaner that is clamped to the top of

+CLEAN THE CARBURETORS INSIDE AND OUT BEFORE INSTALLING.
(remove plugs from the float bowl vents on 40mm carbs)

the carburetor by the air horns. A new gasket should go between the air horn shield and the carburetor. A gasket can go under the air horns if you want to be sure of getting an accurate adjustment with the Uni-Syn.

Next, the linkage should be hooked up except for the short ball jointed carburetor rods. If you are converting to Webers from Zeniths, the linkage arm connected to the crossbar on the right side sometimes has to be bent further to the right to allow the short ball jointed carb rod to travel in a totally vertical plane when viewing the mechanism from the rear of the vehicle. Find the idlescrew at the rear of each carb and turn the screw all the way out so that the throttle plates rest against the throttle bore walls. Now turn the screw in until it just touches the throttle arm and then turn it 1/2 turn more. Repeat with the other carb. Now adjust the short ball jointed rods so that they can be snapped onto the throttle arm ball without disturbing the throttle setting. This should give the carbs side to side balance.

Oil the throttle shafts and accelerator pump linkage (henceforth every 3,000 miles) and check for smooth operation. Take the play out of the linkage by shortening the long ball jointed rod that connects the pivot point on the front of the left manifold to the crossbar; making sure that the throttle closes all the way. Next, have someone get inside the car and floor the gas pedal while you are looking into the carbs to make sure the throttle plates rise to a complete vertical position. You may have to adjust the throttle stop behind the pedal. Be sure throttle plates don't go past the vertical position.

You can now hook up the fuel lines. If the original braided fuel lines to the carburetors are old and ragged and you don't want to buy the complete set-up from Porsche you can remove the entire assembly from the car, cut about 1/2" from the metal lines and install regular neoprene fuel hose and stainless hose clamps. Don't forget the filters. The German high pressure fuel line is safer.

You now have all your tools together and are ready to adjust the carbs. The initial adjustment on the Mixture Screws is 1 1/2 turns out from the seats. The Idle Screws are 1/2 turn in after touching the throttle arm on each carb. The Air Screws are 1/2 turn out & 8 mm nuts are lightly locked with the screws being held stationary. Attach the Tach-Dwell Meter (on CD ignition the hot lead goes to an adaptor on the point wire connection on the distributor). Warm the engine to at least 140 degrees. Unlock the rod from the right carb and evenly turn the idle screws in until the tach reads 1100 rpm. Check the side to side balance of the carbs with the Uni-Syn to make sure both sides of the engine are pulling equal vacuum. Adjust an idle screw if need be. Pick a barrel and turn the mixture screw in until the engine speed drops and then slowly out again until it runs smoothly. Remember to let the engine speed stabilize after each increment of screw turn. If you found that the engine runs smoothly at less than the initial 1 1/2 turn setting then you can turn all the other mixture screws a half turn in and start over. If you need 2 1/2 turns to make the engine run well then do it. 3 1/2 turns out or more usually calls for bigger idle jets.

If the engine doesn't respond when you turn one of the mixture screws in and out it means that the cylinder is not getting ignition or it is not getting idle mixture. If the ignition and compression on the cylinder check out then an idle passage is plugged. Remove the mixture screw and idle jet and blow air back and forth to clear the obstruction. DON'T put compressed air through the float vent. If this doesn't work the idle passages have to be boiled out and possibly checked with a duct guage. Always oil o-rings when replacing idle jets.

After you have the idle mixture initially adjusted you can bring out your Uni-Syn and adjust the Air Screws. Find the barrel which is pulling the most vacuum, adjust the floating ball to the center level in the Uni-Syn using the adjustment on the Uni-Syn, then adjust the other cylinders to an equal vacuum using the air screws. The cylinder which is pulling the most vacuum you leave alone. Remember to unlock the nuts before adjusting the air screws. Tighten

them by hand as you go along; when you're finished you can tighten them using the 8mm wrench while holding the screw stationary with the stubby screwdriver.

Now readjust the mixture screws until you get the correct adjustment. Usually you'll turn the mixture screw in until the engine slows down and then out again slowly until it runs smoothly and then perhaps another half turn. You want the maximum speed with the least fuel. It takes practice. Sometimes as you turn out the mixture screw it speeds up the engine enough to advance the timing and that immediately adds 300 or 400 rpm. When you turn the idle screws back a hair to correct this the weights flop back and this is what slows the engine. It's best to get your initial adjustment around 1100 rpm and hope the distributor doesn't intercede. Check the side to side balance each time you adjust the idle screws. The mixtures can be a little lean or a little rich but they must be consistent from cylinder to cylinder.

When you are finished adjusting the mixture screws back-off the idle screws evenly to 850-950 rpm and check balance. Adjust the rod that attaches to the right carb throttle arm unless it will snap on without moving the throttle. You can check the balance at 3000 rpm also. Before you put the air cleaner on take a look at the front of the engine in the area of the pressure sender and thermostat. If it's wet with oil put a new o-ring on the thermostat before your clutch gets wet.

You check the injection quantity with a narrow cc measuring vial which can be purchased from a pharmaceutical supply house. Attach a wire around it and hang it down to catch the gas as it squirts out of the accelerator pump jet. .8 cc for one complete throttle action is about right. The injection quantity can be varied by adjusting the length of the stroke using the nuts on the threaded shaft. The ignition is turned off during this operation. Start engine to burn out gas each time.

The float level should always be checked on new carburetors. It's a good idea to check the float level when a carburetor is rebuilt and new needle valves are installed. It's possible to check the float level with the engine running using [illegible]ge tool P 226a. This gauge clamps onto the float bowl after you remove the float bowl plug. Remember to use the fiber washer which comes with the guage and screw the gauge in fairly tight since if it leaks the float won't rise and gas will pour out of the carb when you start the engine. Always wipe up any spilled gas after you install the guage and before you start the engine. If the float level is incorrect, you remove the large brass plug over the float needle valve and add or subtract height by using various thickness washers under the needle valve. The washers are available in the gasket kit. Porsche Mailorder manufactures the guages.

If you spend a day tuning your carbs you've gained experience and patience. You have also changed the shape of your knees. Treat the needle seats with respect because they can't be replaced. When adjusting the mixture screws remember that they can <u>all</u> be a little lean, or they can <u>all</u> be a little rich, but they should be one way <u>or</u> the other.

Always check for water in the fuel system. Protect your investment!

The carburetors should be checked for percolation in the float bowls after the [illegible]ngine is thoroughly heated and car is allowed to sit. If this condition exists, [illegible]nd it is not due to too high of float level or pressure in the gas tank, the 914-6 [illegible]henolic insulators should be placed under the intake manifolds. The part number is: [illegible]01-108-131-00. They have to be opened-up for cars with a larger than 32mm port [illegible]ize. A variety of these insulators are available from PORSCHE MAILORDER.

PORSCHE MAILORDER
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Drawing 1

Weber 40 IDA3C Carburetor